

CLAIMS

1. A method for producing a peptide having three or more amino acid residues, comprising:

the step of forming the peptide having three or more amino acid
5 residues with an enzyme or enzyme-containing substance,
wherein the enzyme or enzyme-containing substrate has an ability to use as substrates an amine component having two or more amino acid residues and a carboxy component, to form a peptide having one more peptide bond than the amine component.

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2. The method for producing a peptide according to claim 1, wherein the enzyme or enzyme-containing substance comprises one type or two or more types selected from the group consisting of a culture of a microbe, microbial cells separated from the culture, and a treated microbial cell product of the
15 microbe which have the ability to use as substrates an amine component having two or more amino acid residues and a carboxy component, to form a peptide having one more peptide bond than the amine component.

3. The method for producing a peptide according to claim 1, wherein the
20 enzyme or enzyme-containing substance is able to use, as the carboxy component, both an amino acid ester and an amino acid amide.

4. The method for producing a peptide according to claim 1, wherein the enzyme or enzyme-containing substance is able to use as a the amine
25 component any of (i) an unprotected peptide having two or more amino acid

residues, (ii) a C-protected peptide having two or more amino acid residues, and (iii) a peptide having two or more amino acid residues whose C-terminal molecule is an amine instead of an amino acid.

- 5 5. The method for producing a peptide according to claim 1, wherein the enzyme is a protein (A) or (B):

(A) a protein having an amino acid sequence consisting of amino acid residues numbers 23 to 616 of an amino acid sequence described in SEQ ID NO: 6 of the Sequence Listing,

- 10 (B) a protein having an amino acid sequence including substitution, deletion, insertion, addition, and/or inversion of one or a plurality of amino acids in the amino acid sequence consisting of amino acid residues 23 to 616 of the amino acid sequence described in SEQ ID NO: 6 of the Sequence Listing, and having activity to use as substrates an amine component having
15 two ore more amino acid residues and a carboxy component, to form a peptide having one more peptide bond than the amine component.

6. The method for producing a peptide according to claim 1, wherein the enzyme is a protein (C) or (D):

- 20 (C) a protein having an amino acid sequence consisting of amino acid residues numbers 21 to 619 of an amino acid sequence described in SEQ ID NO: 12 of the Sequence Listing,

- (D) a protein having an amino acid sequence including substitution, deletion, insertion, addition, and/or inversion of one or a plurality of amino acids in the
25 amino acid sequence consisting of amino acid residues 21 to 619 of the amino

acid sequence described in SEQ ID NO: 12 of the Sequence Listing, and having activity to use as substrates an amine component having two or more amino acid residues and a carboxy component, to form a peptide having one more peptide bond than an amine component.

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7. The method for producing a peptide according to claim 1, wherein the enzyme is a protein (E) or (F):

(E) a protein having an amino acid sequence described in SEQ ID NO: 6 of the Sequence Listing,

10 (F) a protein containing a mature protein region, the protein having an amino acid sequence including substitution, deletion, insertion, addition, and/or inversion of one or a plurality of amino acids in the amino acid sequence described in SEQ ID NO: 6 of the Sequence Listing, and having activity to use as substrates an amine component having two or more amino acid residues
15 and a carboxy component, to form a peptide having one more peptide bond than the amine component.

8. The method for producing a peptide according to claim 1, wherein the enzyme is a protein (G) or (H):

20 (G) a protein having an amino acid sequence described in SEQ ID NO: 12 of the Sequence Listing,

(H) a protein containing a mature protein region, the protein having an amino acid sequence including substitution, deletion, insertion, addition, and/or inversion of one or a plurality of amino acids in the amino acid sequence
25 described in SEQ ID NO: 12 of the Sequence Listing, and having activity to use

as substrates an amine component having two or more amino acid residues and a carboxy component, to form a peptide having one more peptide bond than the amine component.

5 9. The method for producing a peptide according to claim 2, wherein the microbe is a microbe belonging to the genus *Empedobacter* or belonging to the genus *Sphingobacterium*.

10 10. The method for producing a peptide according to claim 2, wherein the microbe is a microbe that has been transformed so as to be able to express a protein encoded by a DNA (a) or (b):

(a) a DNA having a base sequence consisting of bases numbers 127 to 1908 of a base sequence described in SEQ ID NO: 5 of the Sequence Listing,

15 (b) a DNA that hybridizes with a DNA having a base sequence complementary to the base sequence consisting of bases numbers 127 to 1908 of the base sequence described in SEQ ID NO: 5 of the Sequence Listing under stringent conditions, and encodes a protein that has peptide-forming activity.

20 11. The method for producing a peptide according to claim 2, wherein the microbe is a microbe that has been transformed so as to be able to express a protein encoded by a DNA (c) or (d):

(c) a DNA that consists of bases numbers 121 to 1917 of the base sequence described in SEQ ID NO: 11 of the Sequence Listing,

25 (b) a DNA that hybridizes with a DNA consisting of a base sequence

complementary to the base sequence consisting of bases numbers 121 to 1917 of the base sequence described in SEQ ID NO: 11 of the Sequence Listing under stringent conditions, and encodes a protein that has a peptide-forming activity.

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12. The method for producing a peptide according to claim 2, wherein the microbe is a microbe that has been transformed so as to be able to express protein encoded by a DNA (e) or (f):

(e) a DNA having a base sequence consisting of bases numbers 61 to 1908 of a base sequence described in SEQ ID NO: 5 of the Sequence Listing,

(f) a DNA that hybridizes with a DNA having a base sequence complementary to the base sequence consisting of bases numbers 61 to 1908 of the base sequence described in SEQ ID NO: 5 of the Sequence Listing under stringent conditions, and encodes a protein that has a peptide-forming activity.

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13. The method for producing a peptide according to claim 2, wherein the microbe is a microbe that has been transformed so as to be able to express a protein encoded by a DNA (g) or (h):

20 (g) a DNA that consists of bases numbers 61 to 1917 of the base sequence described in SEQ ID NO: 11 of the Sequence Listing,

(h) a DNA that hybridizes with a DNA consisting of a base sequence complementary to the base sequence consisting of bases numbers 61 to 1917 of the base sequence described in SEQ ID NO: 11 of the Sequence Listing under stringent conditions, and encodes a protein that contains a mature

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protein region having a peptide-forming activity.

14. The method for producing a peptide according to claim 1, wherein the carboxy component comprises one type or two or more types selected from the group consisting of an L-alanine ester, a glycine ester, an L-threonine ester, an L-tyrosine ester and a D-alanine ester.